

WHAT IS CLAIMED IS:

1. A contention arbitration apparatus for arbitrating an access contention caused when a plurality of application
5 programs simultaneously attempt to access at least one physical device, the contention arbitration apparatus comprising:

a resource information storing section for storing resource information which indicates a correspondence between at least one resource, which defines functions of said at least one
10 physical device, and at least one application program, which is allowed to use functions associated with said at least one resource;

a device information storing section for storing device information which indicates a correspondence between a logic device, which defines functions specified by said at least one application
15 program which attempts to access said at least one physical device, and said at least one resource which defines functions required for implementing functions defined by the logic device;

a used resource recognizing section for recognizing a resource associated with the logic device specified by said at
20 least one application program by reference to the device information;

a resource access determining section for determining by reference to the resource information which application program is allowed to access the resource recognized by the used resource
25 recognizing section; and

a device access determining section for determining, based on a determination result provided by the resource access determining section, whether the application program which has specified the logic device is able to access said at least one
5 physical device which implements the functions defined by the logic device.

2. The contention arbitration apparatus according to claim 1,

10 wherein the resource information contains multiple access information which indicates whether to allow simultaneous accesses from a plurality of application programs, and

wherein when the simultaneous accesses from the plurality of application programs are allowed, the resource access
15 determining section allows the plurality of application programs to access the resource based on the multiple access information.

3. The contention arbitration apparatus according to claim 2, wherein the resource access determining section allows
20 the plurality of application programs to access the resource only when a prescribed condition is satisfied.

4. The contention arbitration apparatus according to claim 3, wherein the prescribed condition is that the plurality
25 of application programs use the same scheme to implement a function

provided by the resource.

5. The contention arbitration apparatus according to claim 1, further comprising an executing section for executing
5 a device driver for controlling said at least one physical device when the device access determining section determines that said at least one application program which has specified the logic device is allowed to access said at least one physical device.

10 6. The contention arbitration apparatus according to claim 5, wherein the executing section sends an error message to said at least one application program having specified the logic device when the access determining section determines that said at least one application is not allowed to access said at least
15 one physical device.

7. The contention arbitration apparatus according to claim 1, wherein the resource access determining section determines which application program is allowed to access said at least one
20 physical device based on priorities of the plurality of application programs.

8. The contention arbitration apparatus according to claim 7, further comprising an application information storing
25 section for storing information about the priorities of the

plurality of application programs.

9. The contention arbitration apparatus according to claim 7,

5 wherein the resource information contains additional information which indicates whether to grant an access right to an application program having provided an access indication first or last; and

 wherein when the plurality of application programs have
10 the same priorities, the resource access determining section determines which one of the application programs is to be granted the access right based on the additional information.

10. The contention arbitration apparatus according to
15 claim 1, further comprising:

 an application information storing section for storing, as application information, a correspondence between a determination result obtained by the device access determining section and the plurality of application programs; and

20 an executing section for executing a device driver for controlling said at least one physical device,

 wherein when an access start indication is provided by an application program to specify the logic device, the device access determining section determines whether the application
25 program is able to access said at least one physical device and

stores a determination result into the application information storing section; and

wherein when an access indication is provided after the access start indication, the executing section refers to the application information stored in the application information storing section to determine whether the application program is able to access said at least one physical device.

11. The contention arbitration apparatus according to claim 10, wherein when an access indication is provided by an application program which is not able to access said at least one physical device, the executing section sends an error message to the application program.

12. The contention arbitration apparatus according to claim 10, wherein when an access indication is provided by an application program, which is not allowed to access said at least one physical device since access to said at least one physical device is granted to another application program, the executing section sends an error message to the application program.

13. The contention arbitration apparatus according to claim 1,

wherein upon receipt of an access termination indication from said at least one application program, the resource access

determining section grants an access right to another application program which attempts to use the functions associated with the resource and updates the resource information such that a result of the grant of the access right is reflected in the resource information; and

wherein the device access determining section determines whether said another application program is able to access said at least one physical device based on the resource information updated by the resource access determining section.

14. The contention arbitration apparatus according to claim 13, further comprising:

an application information storing section for storing, as application information, a correspondence between a determination result obtained by the device access determining section and the plurality of application programs; and

an executing section for updating the application information based on the determination result obtained by the device access determining section.

15. The contention arbitration apparatus according to claim 13, further comprising an executing section for changing a setting of a device driver when the device access determining section determines that said another application program is able to access said at least one physical device, the setting being

changed such that said another application program is allowed to access the physical device.

16. The contention arbitration apparatus according to
5 claim 1, wherein when only said at least one application program, which specifies the logic device, is allowed to use the functions associated with all the resources associated with the logic device, the device access determining section determines that said at least one application program is allowed to use said at least one physical
10 device.

17. The contention arbitration apparatus according to claim 1, wherein when only said at least one application program, which specifies the logic device, is associated with a part of
15 the resources associated with the logic device, the device access determining section determines that said at least one application program is allowed to use functions defined by the part of the resources when accessing said at least one physical device.

20 18. The contention arbitration apparatus according to claim 1, further comprising an application I/F section for accepting specification of the logic device from said at least one application program.

25 19. The contention arbitration apparatus according to

claim 1,

wherein the resource information contains additional information which indicates for each resource whether to grant an access right to an application program having provided an access indication first or last; and

wherein the resource access determining section determines which application program is granted the access right based on the additional information.

20. A contention arbitration program for causing a computing apparatus to arbitrate an access contention caused when a plurality of application programs simultaneously attempt to access at least one physical device, the computing apparatus having stored therein resource information which indicates a correspondence between at least one resource, which defines functions of said at least one physical device, and at least one application program, which is allowed to use functions associated with said at least one resource, and also having stored therein device information which indicates a correspondence between a logic device, which defines functions specified by said at least one application program which attempts to access said at least one physical device, and said at least one resource which defines functions required for implementing functions defined by the logic device, the contention arbitration program causing the computing apparatus to perform a contention arbitration method comprising

the steps of:

recognizing a resource associated with the logic device specified by said at least one application program by reference to the device information;

5 determining by reference to the resource information which application program is allowed to access the recognized resource; and

 determining, based on a determination result obtained by the step of determining by reference to the resource information,
10 whether the application program which has specified the logic device is able to access said at least one physical device which implements the functions defined by the logic device.

21. A contention arbitration method for causing a
15 computing apparatus to arbitrate an access contention caused when a plurality of application programs simultaneously attempt to access at least one physical device, the computing apparatus having stored therein resource information which indicates a correspondence between at least one resource, which defines
20 functions of said at least one physical device, and at least one application program, which is allowed to use functions associated with said at least one resource, and also having stored therein device information which indicates a correspondence between a logic device, which defines functions specified by said at least one
25 application program which attempts to access said at least one

physical device, and said at least one resource which defines functions required for implementing functions defined by the logic device, the contention arbitration method comprising the steps of:

5 recognizing a resource associated with the logic device specified by said at least one application program by reference to the device information;

 determining by reference to the resource information which application program is allowed to access the recognized
10 resource; and

 determining, based on a determination result obtained by the step of determining by reference to the resource information, whether the application program which has specified the logic device is able to access said at least one physical device which
15 implements the functions defined by the logic device.